Claims 1 - 19 are pending. By this Preliminary Amendment, the title, specification and claims are amended. Prompt and favorable examination on the merits is respectfully requested.

The attached Appendix includes marked-up copies of each rewritten paragraph (37 C.F.R. §1.121(b)(1)(iii)) and claim (37 C.F.R. 1.121(c)(1)(ii)).

Respectfully submitted,

Mario A. Costantino
Registration No. 33,565

Thomas J. Pardini
Registration No. 30,411

MAC:TJP/mlb
Attached: Appendix
Date: September 4, 2002

OLIFF & BERRIDGE, PLC
P.O. Box 19928
Alexandria, Virginia 22320
Telephone: (703) 836-6400

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APPENDIX

Changes to Title:

The following is a marked-up version of the amended title:

~~EXPOSURE DEVICE WITH LASER DEVICE~~

EXPOSURE APPARATUS WITH LASER DEVICE

Changes to Specification:

Page 1, between lines 2 and 3, a new paragraph is added.

This application is the national phase under 35 U.S.C. 371 of prior PCT International Application No. PCT/JP00/06132 which has an International filing date of September 8, 2000 which designated the United States of America, the entire contents of which are hereby incorporated by reference.

Page 7, line 16 to page 8, line 14:

A first exposure apparatus of the present invention illuminates a pattern of a first object ~~(163)~~ with ultraviolet light from a laser device and exposes a second object ~~(166)~~ with the ultraviolet light which has passed through the first object. The laser device includes a laser light generation section ~~(11)~~ which generates single wavelength laser light in a wavelength range of from an infrared region to a visible region, an optical modulating section ~~(12)~~ which modulates the laser light generated by the laser light generation section, an optical amplification section ~~(18-1 to 18-n)~~ including an optical fiber amplifier ~~(22, 25)~~ which amplifies the laser light generated by the optical modulating section, and a wavelength conversion section ~~(20)~~ which performs wavelength conversion of the laser light amplified by the optical amplification section into ultraviolet light by using a nonlinear optical crystal ~~(502 to 504)~~. The optical modulating section performs pulse modulation of the laser light from the laser light generation section, and feeds the modulated laser light to the optical amplification section in a period in which the ultraviolet light is output, and the optical modulating section

feeds light of an amplifiable wavelength zone to the optical amplification section in a range substantially not influencing an output of the ultraviolet light even in a period in which the ultraviolet light is not output.

Page 8, line 15 to page 9, line 2:

A second exposure apparatus of the present invention illuminates a first object ~~(163)~~ with ultraviolet light from a laser device and exposes a second object ~~(166)~~ with the ultraviolet light which has passed through the first object. The laser device includes a laser light generation section ~~(11)~~ which generates single wavelength laser light, an optical amplification section ~~(18-1 to 18-n)~~ including an optical fiber amplifier which amplifies the laser light, and a wavelength conversion section ~~(20)~~ which performs wavelength conversion of the amplified laser light. The second exposure apparatus is provided with a light feed section ~~(12)~~ which feeds light to the optical amplification section in a condition different from that in a period in which the ultraviolet light is output even in a period in which the ultraviolet light is not output.

Page 12, lines 11-27:

A second method is arranged such that, in addition to the laser light generation section ~~(11)~~ (reference light source), an auxiliary light source ~~(51)~~ is provided which generates auxiliary light (whose wavelength hereinbelow will be represented by λ_2) having a wavelength different from that of the laser light (whose wavelength hereinbelow will be represented by λ_1) generated by the laser light generation section, and the auxiliary light is fed to the optical amplification section in the "OFF" period. In this case, the wavelength λ_2 of the auxiliary light is preferably a wavelength which is out of a tolerated wavelength range in which wavelength conversion is possible in the wavelength conversion section, and is preferably a wavelength which is within a gain range of the optical fiber amplifier. Thereby,

the optical surge of the optical fiber amplifier can be mitigated without influencing ultraviolet light that is to be finally output.

Page 13, line 1 to page 14, line 6:

The WDM (wavelength division multiplexing) member ~~(52)~~ for combining the auxiliary light with the laser light may be disposed in one of an input portion of the modulator ~~(12)~~ and an output portion thereof. In a configuration where the WDM member is disposed in the input portion of the modulator, the laser light generation section as the reference light source is switched with the same phase as that of the ultraviolet light that is finally output. That is, the laser light generation section is switched "ON" in a period in which the ultraviolet light is in the state of "ON" and the laser light generation section is switched "OFF" in a period in which the ultraviolet light is in the state of "OFF". In addition, switching of the auxiliary light is performed with the opposite phase to the ultraviolet light; that is, switching is performed with a timing in which the auxiliary light source is switched "OFF" when the ultraviolet light is in the "ON" state and the auxiliary light source is switched "ON" when the ultraviolet light is in the "OFF" state. Moreover, the modulator is capable of regularly performing pulse output regardless of the "ON/OFF" state of the ultraviolet light. Furthermore, in the "ON" period of the ultraviolet light, the modulator is capable of performing pulse output, and in the "OFF" period of the ultraviolet light, the modulator is capable of performing output of a constant level of a low peak level or performing pulse output of a high duty ratio. Among the above control patterns is preferably selected a control pattern in which only the light having the wavelength λ_2 is output to each of the optical amplification section in the "OFF" state of the ultraviolet light. In a configuration where the WDM member ~~(52)~~ is disposed in the output portion of the modulator ~~(12)~~, light of a low peak level may preferably be fed from the auxiliary light source in the "OFF" state of the ultraviolet light.

Page 14, line 7 to page 15, line 2:

A third method is preferably arranged such that, in addition to the laser light generation section ~~(11)~~ (reference light source), an auxiliary light source ~~(54)~~ is provided which generates auxiliary light of a polarized state different from that of the laser light generated by the laser light generation section and the auxiliary light is fed to the optical amplification section in the "OFF" period. In this case, the polarized state of the laser light from the laser light generation section is preferably a state (for example, linear polarization along a predetermined direction) in which the efficiency of conversion into the ultraviolet light in the wavelength conversion section is maximized. The polarization state of the auxiliary light is preferably a state (such as a state of polarized light of which the polarization direction is perpendicular) in which the efficiency of conversion into the ultraviolet light in the wavelength conversion section is minimized. Thereby, in the "OFF" state of the ultraviolet light, the auxiliary light is fed to the optical fiber amplifier, and the optical surge that can occur thereafter is thereby mitigated. In addition, the conversion efficiency in the wavelength conversion section is substantially zero, and the ultraviolet light output intensity substantially becomes zero.

Page 15, lines 3-12:

Similar to the above-described second method, also in the present method, a polarized-wave combining member ~~(55)~~ for combining the auxiliary light with the laser light may be disposed in one of an input portion of the modulator ~~(12)~~ and an output portion thereof. Also control patterns for switching timings for the auxiliary light may be similar to those in the second method. Among the control patterns is preferably selected a control pattern in which only the auxiliary light is fed to the optical amplification section in the "OFF" state of the ultraviolet light.

Page 15, lines 13 to page 16, line 3:

Preferably, the laser device of the each of the above-described exposure apparatuses is configured to further include an optical splitter section ~~(14, and 16-1 to 16-m)~~ which splits the laser light generated by the laser light generation section into a plurality of laser light beams, and in this configuration, optical amplification section ~~(18-1 to 18-n)~~ is independently provided for each of the plurality of split laser light beams, and the wavelength conversion section collects fluxes of laser light beams output from the plurality of optical amplification sections and performs wavelength conversion thereof. Thus, the laser light split by the optical splitters are sequentially imparted with predetermined differences in optical path lengths and therefore, the spatial coherence of the laser light finally bundled can be reduced. Moreover, since each of the laser light beams is generated by the common laser light generation section, the spectral linewidth of the finally obtained ultraviolet light is narrow.

Page 17, lines 12-21:

The exposure apparatus of the present invention further includes an illumination system ~~(162)~~ which irradiates a mask ~~(163)~~ with ultraviolet light from the laser device, and a projection optical system ~~(165)~~ which projects an image of a pattern of the mask onto a substrate ~~(166)~~, wherein the substrate is exposed with the ultraviolet light which has passed through the pattern of the mask. With the laser device of the present invention being used, the exposure apparatus can be miniaturized overall, and the maintainability thereof is increased.

Page 18, line 18 to page 19, line 17:

Next, an exposure apparatus manufacturing method of the present invention is a method of manufacturing an exposure apparatus which illuminates a pattern of a first object ~~(163)~~ with ultraviolet light from a laser device and which exposes a second object ~~(166)~~ with the ultraviolet light which has passed through the pattern of the first object, wherein the laser device is configured by disposing, with a predetermined relationship, a laser light generation section ~~(11)~~ which generates single wavelength laser light in a wavelength range of from an

infrared region to a visible region, an optical modulating section ~~(12)~~ which modulates the laser light generated by the laser light generation section, an optical amplification section ~~(18-1 to 18-n)~~ including an optical fiber amplifier ~~(22 and 25)~~ which amplifies the laser light generated by the optical modulation section, and a wavelength conversion section ~~(20)~~ which performs wavelength conversion of the laser light amplified by the optical amplification section into ultraviolet light by using a nonlinear optical crystal ~~(502 to 504)~~, and wherein the optical modulating section is configured such that the laser light output from the laser light generation section is pulse-modulated and fed to the optical amplification section in a period in which the ultraviolet light is output, and light of an amplifiable wavelength zone is fed to the optical amplification section in a range substantially not influencing output of the ultraviolet light even in a period in which the ultraviolet light is not output.

Page 19, lines 23-24:

Figs. 1A and 1B are ~~Fig. 1 is a~~ diagrams showing an ultraviolet light generator of a first embodiment of the present invention.

Page 19, lines 25-26:

Fig. 2 is a diagram showing a configuration example of optical amplifier units 18-1 to 18-n shown in Figs. 1A and 1B.~~Fig. 1.~~

Page 20, lines 1-5:

Fig. 3A ~~In Fig. 3, Fig. 3(a)~~ is a diagram showing a first configuration example of a wavelength conversion section 20 shown in Figs. 1A and 1B~~Fig. 1~~, and Fig. 3B ~~Fig. 3(b)~~ is a diagram showing a second configuration example of the wavelength conversion section 20.

Page 20, lines 6-9:

Fig. 4A ~~In Fig. 4, Fig. 4(a)~~ is a diagram showing a third configuration example of a wavelength conversion section 20, Fig. 4B ~~and Fig. 4(b)~~ is a diagram showing a fourth configuration example of the wavelength conversion section 20.

Page 20, lines 10-11:

Figs. 5A and 5B are ~~Fig. 5 is an~~ explanatory views of a case where an optical surge occurs in the optical fiber amplifier shown in Figs. 1A and 1B.~~Fig. 1.~~

Page 20, lines 12-16:

Figs. 6A and 6B are ~~Fig. 6 is a~~ diagrams showing a state of a laser beam that is to be output from an optical modulating device 12 and a state of a finally output laser beam LB5 in an ultraviolet region according to a first embodiment of the present invention.

Page 20, lines 20-22:

Figs. 8A, 8B, 8C and 8D are ~~Fig. 8 is a~~ timing charts showing an example of a driving method for individual laser beams and the optical modulating device 12 according to the second embodiment.

Page 20, lines 23-25:

Figs. 9A, 9B, 9C and 9D are ~~Fig. 9 is a~~ timing charts showing another example of a driving method for individual laser beams and the optical modulating device 12 according to the second embodiment.

Page 21, line 18 to page 22, line 3:

Fig. 1A ~~1(a)~~ shows an ultraviolet light generator according to the present embodiment. Referring to Fig. 1A~~1(a)~~, a single wavelength oscillatory laser 11, which is provided as a laser light generation section, generates a laser beam LB1 that is formed of, for example, a continuous wave (CW) having a narrow spectral width and that has a wavelength of 1.544 μm. The laser beam LB1 is incident on an optical modulating device 12, which is provided as an optical modulator, via an isolator IS1 provided for blocking reverse light. The laser beam LB1 is converted therein into a laser beam LB2 (pulsed beam), and the laser beam LB2 is then incident on an optical splitting amplifier section 4.

Page 24, lines 11-27:

The laser beams amplified by the m-group optical amplifier units 18-1 to 18-n propagate through extended portions of output terminals of optical fibers (described below) doped with a predetermined matter in the respective optical amplifier units 18-1 to 18-n. The aforementioned extended portions form a fiber bundle 19. The lengths of the m-group n optical fibers forming the fiber bundle 19 are identical to one another. However, the configuration may be such that the fiber bundle 19 is formed bundling, and the laser beams amplified by the optical amplifier units 18-1 to 18-n are transferred to the corresponding optical fibers. Thus, the optical splitting amplifier unit 4 is configured to include the members provided between the optical fiber amplifier 13 and the fiber bundle 19. The configuration of the optical splitting amplifier section 4 is not limited to that shown in Figs. 1A and 1B. ~~Fig. 1.~~ For example, a time division multiplexer may be used as an optical splitter.

Page 25, lines 12-25:

Moreover, as shown in Fig. 1B~~(b)~~, output terminals 19a of the fiber bundle 19 are bundled such that the m·n optical fibers (128 optical fibers in the present embodiment) tightly contacts one another, and the outer shape thereof is circular in a cross-sectional view. In a practical configuration, however, the outer shape of the output terminals 19a and the number of optical fibers are determined according to, for example, the rear-stage configuration of the wavelength conversion section 20 and use conditions of the ultraviolet light generator of the present embodiment. The clad diameter of each of the optical fibers constituting the fiber bundle 19 is about 125 μm. Accordingly, when 128 optical fibers are bundled circular, a diameter d1 of each of the output terminals 19a can be set to about 2 mm or smaller.

Page 28, lines 6-25:

Hereinbelow, the present embodiment will be described in further detail. Referring to Fig. 1A ~~(a)~~, for the single wavelength oscillatory laser 11 oscillating at a single wavelength,

the present embodiment uses, a laser, such as a distributed feedback (DFB) semiconductor laser. The DFB semiconductor laser is characterized by an InGaAsP construction, a 1.544 μm oscillation wavelength, and a 20 mW continuous output (which hereinbelow will be referred to as "CW output"). In addition, the DFB semiconductor laser is configured such that, instead of a Fabry-Pelot resonator, a diffraction grating is formed in a semiconductor laser, in which single longitudinal mode oscillation is performed under any condition. Thus, since the DFB semiconductor laser performs the single longitudinal mode oscillation, the oscillation spectral linewidth can be controlled to be 0.01 pm or less. Alternatively, for the single wavelength oscillatory laser 11, the present embodiment may be configured using a light source such as an erbium(Er)-doped fiber laser capable of generating a laser beam having a wavelength region similar to the above and a narrowed bandwidth.

Page 33, lines 5-24:

The laser beam LB1, formed of continuous light output from the single wavelength oscillatory laser 11, is converted into the laser beam LB2, formed of a pulsed beam, by use of the optical modulating device 12. The optical modulating device 12 is formed of, for example, an electrooptical modulating device or an acousto-optical modulating device. The optical modulating device 12 is driven by the control section 1 through the driver 3. The optical modulating device 12 can be considered to be a part of the light supply portion. As shown in Figs. 6A~~6(a)~~ and 6B~~6(b)~~, the laser beam LB2 that has been output from the optical modulating device 12 of the present example is a pulse train of a peak level LB in a period in which the laser beam LB5 in the form of ultraviolet light is output, that is, in the "ON" period. The laser beam LB2 is continuous light of a level LA in a period in which the laser beam LB5 in the form of ultraviolet light is not output, that is, in the "OFF" period. In Figs. 6A~~(a)~~ and 6B~~(b)~~ (also in Figs. 5A and 5B~~Fig. 5~~), the horizontal axis represents time "t", and the vertical axis represents the laser-beam output (energy per unit time).

Page 33, line 25 to page 34, line 25:

Referring to Figs. 6A and 6B~~Fig. 6~~, an average level (average value obtained through integration) of the laser beam LB2 during the period in which the ultraviolet light is "ON" is set to be substantially the same as an average level (= LA) of the laser beam LB2 during the period in which the ultraviolet light is "OFF". In this case, duty ratio (ratio (%) of a high level "1" period to the pulse cycle) of the laser beam LB2 in the period in which the ultraviolet light is "ON" is set to be 1/10 or lower, and is ordinarily set to be about 1/10000. Therefore, the level LA is 1/10 or lower with respect to the peak level LB, and is ordinarily about 1/10000 or lower. Thus, the level of the laser beam LB2 is maintained to be at the predetermined level LA even in the period in which the ultraviolet light is "OFF". This prevents the output power of the ultraviolet light (laser beam LB5) from increasing according to increase in gains because of optical surges in the rear-stage optical fiber amplifier 13 and the optical fiber amplifiers (the optical fiber amplifiers 22 and 25 shown in Fig. 2) in the optical amplifier units 18-1 to 18-n when the ultraviolet light is switched "ON". On the other hand, however, as shown in Fig. 5A~~(a)~~, when the output power of the laser beam LB2 is set to 0, as shown in Fig. 5B~~(b)~~, an optical surge occurs of the rear-stage optical fiber amplifier in a period TS immediately after the ultraviolet light is switched "ON". This increases the peak level of the pulse train of the ultraviolet light (laser beam LB5), causing the output power of the ultraviolet light to deviate from the desired value.

Page 34, line 26 to page 35, line 22:

The wavelength conversion section 20 shown in Figs. 1A and 1B ~~Fig. 1~~ converts the input laser beam LB4 into the laser beam LB5 in the form of ultraviolet light through at least three stages of nonlinear optical crystals (which will be described below in detail). In this case, in each of the nonlinear optical crystals, wavelength conversion is performed substantially in proportion either to the square of the peak level of incident light or to the

product of the peak levels of the two incident lights. Consequently, the output power of the laser beam LB5 that is to be output from the wavelength conversion section 20 is proportional to a coefficient which is equal to or higher than the eighth power (= the power of 2^3) of the peak level of the incident laser beam LB4. Therefore, in Figs. 6A and 6B~~Fig. 6~~, with respect to the peak level LB of the laser beam LB2 in the period in which the ultraviolet light is "ON", the level LA of the laser beam LB2 in the period in which the ultraviolet light is "OFF" is 1/10 or lower, and is ordinarily about 1/10000 or lower. As such, since the light of the level LA is hardly converted into ultraviolet light (laser beam LB2), the level of the laser beam LB5 substantially completely becomes zero in the period in which the ultraviolet light is "OFF". Consequently, the output power of the ultraviolet light (laser beam LB5) reaches the desired value even in either the "ON" or "OFF" period.

Page 38, lines 2-9:

In Fig. 1A~~(a)~~, the pulsed beam output thus obtained is then coupled to the erbium-doped optical fiber amplifier 13 on the initial stage, and 35 dB (3162 times) amplification is performed thereby. At this stage, the pulsed beam is amplified to have a peak output power of about 63 W and an average output power of about 6.3 mW. In the above-described configuration, a multistaged optical fiber amplifier may be used to replace the optical fiber amplifier 13.

Page 41, lines 4-27:

In addition, the present example is capable of tuning the oscillation timing, i.e., a repetition frequency f by controlling the timing of a driving voltage pulse applied to the optical modulating device 12. Moreover, in a case where output variations can occur with the pulsed beam according to a change in the oscillation timing, the arrangement may be made such that the magnitude of the driving voltage pulse, which is to be applied to the optical modulating device 12, is synchronously tuned to compensate for the output variations. In this

case, the arrangement may be such that the pulsed-beam output variations are compensated for only through the use of oscillation control of the single wavelength oscillatory laser 11 or through the associated use thereof with the above-described control of the optical modulating device 12. Referring to Fig. 1A~~(a)~~, the laser beams passed through the m-group delay fibers (optical fibers 17-1 to 17-n) are incident on the respective optical amplifier units 18-1 to 18-n, and are amplified thereby. The individual optical amplifier units 18-1 to 18-n of the present example have optical fiber amplifiers. While description given hereinbelow will cover example configurations of an optical amplifier unit that may be used for the optical amplifier unit 18-1, the example configurations may similarly be used for the other optical amplifier units 18-2 to 18-n.

Page 43, lines 6-18:

In the present example, the laser beam LB3 from the optical fiber 17-1 shown in Fig. 1A~~(a)~~ is led via the WDM device 21A to be incident on the optical fiber amplifier 22, and is amplified thereby. Then, the laser beam LB3 amplified by the optical fiber amplifier 22 is incident on the optical fiber amplifier 25 via the WDM device 21B, the narrow band filter 24A, the isolator IS3, and WDM device 21C; and the incident laser beam LB3 is thereby amplified again. Via the WDM device 21D, the amplified laser beam LB3 propagates through one of optical fibers that constitute the fiber bundle 19 shown in Fig. 1A~~(a)~~(the aforementioned optical fiber may be an extended portion of an output terminal of the optical fiber amplifier 25).

Page 43, line 19 to page 44, line 6:

The total of amplification gains according to the second-stage optical fiber amplifiers 22 and 25 is 46 dB (39,810 times) as one example. When the total number of channels (m·n pieces) output from the splitters 16-1 to 16-m shown in Fig. 1B~~(b)~~ is 128, and the average output power of each of the channels is about 50 μm, the average output power of all the

channels is about 6.4 mW. When a laser beam of each of the channel is amplified at about 46 dB, the average output power of the laser beam output from each of the optical amplifier units 18-1 to 18-n is about 2 W. When the above is assumed to have been pulsed at a pulsewidth of 1 ns, and a pulse frequency of 100 kHz, the peak output power of each of the laser beams is 20 kW. Also, the average output power of the laser beam Lb4 output from the fiber bundle 19 is about 256 W.

Page 44, lines 7-20:

In the present example, coupling losses in the splitters 14 and 16-1 to 16-m shown in Fig. 1A~~(a)~~ are not taken into consideration. However, even when the coupling losses occur, the output powers of the laser beams of the individual channels can be unformed to be the above-described value (for example, the peak output power of 20 kW). This can be achieved by increasing at least one of the amplification gains obtained according to the optical fiber amplifiers 22 and 25 by the amount of the loss. In addition, the value of the output power (output power of the fundamental wave) of the single wavelength oscillatory laser 11 shown in Fig. 1A~~(a)~~ can be controlled larger or smaller than the aforementioned value. This can be achieved by controlling the amplification gains obtained according to the optical fiber amplifiers 22 and 25.

Page 44, line 21 to page 45, line 10:

Referring to the example configuration shown in Fig. 2, the narrow band filter 24A removes ASE (amplified spontaneous emission) light occurring in each of the optical fiber amplifier 13 shown in Fig. 1A~~(a)~~ and the amplifying optical fiber 22 shown in Fig. 2, and lets the laser beam (having a wavelength width of 1 pm or less) output from the single wavelength oscillatory laser 11 shown in Fig. 1A~~(a)~~ to transmit. Thereby, the narrow band filter 24A substantially makes the wavelength width of the transmitted beam to be a narrow band. This enables the amplification gain of the laser beam to be prevented from being

reduced by the incidence of the ASE light. In this case, the narrow band filter 24A preferably has a transmission wavelength width of about 1 pm. However, since the wavelength width of the ASE light is several tens of nm, the ASE light can be removed not to cause a problem in practice even by using a currently available narrow band filter with a transmission wavelength width of about 100 pm.

Page 45, lines 11-25:

Suppose the output wavelength of the single wavelength oscillatory laser 11 in Fig. 1A~~(a)~~ is positively changed. In this case, while the narrow band filter 24A may be replaced according to the output wavelength. However, preferably, a narrow band filter having a transmission wavelength width (equivalent to a variable range (about ±20 pm, as mentioned above as an example, for an exposure apparatus) is used. Further, the isolator IS3 reduces the influence of reverse light attributed to nonlinear effects of the optical fibers. The optical amplifier unit 18 may be configured by coupling three or more stages of optical fiber amplifiers. Also in this case, the narrow band filter 24A and the isolator IS3 are preferably inserted into the boundary portion between the two adjacent optical fiber amplifiers in the overall configuration.

Page 46, line 12 to page 47, line 4:

In the above-described embodiment, the laser light source having an oscillation wavelength of about 1.544 μm is used for the single wavelength oscillatory laser 11. Instead of this laser light source, however, the embodiment may use a laser light source having an oscillation wavelength in a range of from 1.099 to 1.106 μm. For this laser light source, either a DFB semiconductor laser or an ytterbium(Yb)-doped fiber laser may be used. In this case, for the optical fiber amplifier in the rear-stage optical amplification section, the configuration may use an ytterbium(Yb)-doped fiber (YDFA) that performs amplification in a wavelength zone of 990 to 1200 nm including the wavelength of the amplifier section. In

this case, ultraviolet light having a wavelength of 157 to 158 nm wave that is substantially the same wavelength of the F_2 laser can be obtained by outputting the seventh-order harmonic wave in the wavelength conversion section 20 shown in Fig. 1B~~(b)~~. In practice, ultraviolet light having substantially the same wavelength as that of the F_2 laser can be obtained by controlling the oscillation wavelength to be about 1.1 μm.

Page 51, lines 8-11:

Hereinbelow, a description will be made regarding example configurations of the wavelength conversion section 20 used in the ultraviolet light generator of the embodiment shown in Figs. 1A and 1B.~~Fig. 1.~~

Page 51, line 12 to page 52, line 16:

Fig. 3A~~(a)~~ shows the wavelength conversion section 20 that is capable of obtaining the eighth-order harmonic wave through repetition of the second-order harmonic wave generation. In Fig. 3A~~(a)~~, the laser beam LB4 as the fundamental wave having a wavelength of 1.544 μm (the frequency is represented by "ω") output from the output terminal 19a (shown in an enlarged view) of the fiber bundle 19 is incident on a first-stage nonlinear optical crystal 502. The second-order harmonic wave generation is performed therein to generate the second-order harmonic wave having a twofold frequency 2ω (wavelength: 1/2 of 772 nm) of the frequency ω of the fundamental wave. The generated second-order harmonic wave is then incident on a second-stage nonlinear optical crystal 503 through a lens 505. Similar to the above, through the second-order harmonic wave generation, there is generated fourth-order harmonic wave having a twofold frequency of the frequency 2ω of the incident wave, that is, a fourfold frequency 4ω (wavelength: 1/4 of 386 nm) with respect to the fundamental wave. The generated fourth-order harmonic wave is then transferred to a third-stage nonlinear optical crystal 504 through a lens 506. Similarly, through the second-order harmonic wave generation, there is generated eighth-order harmonic wave having a twofold

frequency of the frequency 4ω of the incident wave, that is, an eightfold frequency 8ω (wavelength: 1/8 of 193 nm) with respect to the fundamental wave. The eighth-order harmonic wave is output as laser beam LB5. Thus, the example configuration performs wavelength modulations in the following order: fundamental wave (wavelength: 1.544 μm) → second-order harmonic wave (wavelength: 772 nm) → fourth-order harmonic wave (wavelength: 386 nm) → eighth-order harmonic wave (wavelength: 193 nm).

Page 53, lines 11-23:

Referring to Fig. 8A~~(a)~~, a converging lens, which is effective for improving the incidence efficiency of laser beam LB4, is preferably provided between the fiber bundle 19 and the nonlinear optical crystal 502. In this case, each of the optical fibers constituting the fiber bundle 19 has a mode diameter (core diameter) of about 20 μm, and a region where the conversion efficiency in the nonlinear optical crystal has a size of about 200 μm. As such, a lens with a very low magnification of about 10× magnification may be provided in units of the optical fiber to converge the laser beam output from each of the optical fibers into the nonlinear optical crystal 502. This applies also to other example configurations described below.

Page 53, line 24 to page 54, line 15:

Fig. 3B~~(b)~~ shows a wavelength conversion section 20A that is capable of obtaining the eighth-order harmonic wave by combining the second-order harmonic wave generation and sum frequency generation. Referring to Fig. 3B~~(b)~~, the laser beam LB4 (fundamental wave) having a wavelength of 1.544 μm output from the output terminal 19a of the fiber bundle 19 is incident on a first-stage nonlinear optical crystal 507 formed of the LBO crystal and controlled by the NCPM method. In the crystal 507, there is generated the second-order harmonic wave according to the second-order harmonic wave generation. In addition, a part of the fundamental wave is transmitted as is through the nonlinear optical crystal 507. Both

the fundamental wave and second-order harmonic wave in a linearly polarized state are transmitted trough a wavelength plate 508 (for example, a 1/2 wavelength plate), and only the fundamental wave is output in a 90-degree rotated direction of polarization. The fundamental wave and the second-order harmonic wave individually pass through a lens 509 and are incident on a nonlinear optical crystal 510.

Page 56, line 24 to page 57, line 17:

The configuration between the second-stage nonlinear optical crystal 510 and the fourth-stage nonlinear optical crystal 517 is not limited to that shown in Fig. 3B~~(b)~~. This configuration may be arbitrarily arranged as long as it has the same optical path lengths for the sixth-order harmonic wave and the second-order harmonic wave to cause the sixth-order harmonic wave and the second-order harmonic wave to be incident on the fourth-stage nonlinear optical crystal 517. Moreover, for example, the third-stage and fourth-stage nonlinear optical crystals 514 and 517 may be disposed on the same optical axis of the second-stage nonlinear optical crystal 510. In this configuration, the third-stage nonlinear optical crystal 514 is used to convert only the third-order harmonic wave into the sixth-order harmonic wave according to the second-order harmonic wave generation, and the converted harmonic wave and the non-converted second-order harmonic wave together are incident on the fourth-stage nonlinear optical crystal 517. This configuration avoids the necessity of using the dichroic mirrors 511 and 516. The above is the same for an example configuration of Figs. 4A and 4B ~~Fig.4~~ described below.

Page 57, line 18 to page 58, line 9:

For the individual wavelength conversion sections 20 and 20A shown in Figs. 3A and 3B~~Fig. 3(a) and (b)~~, the average output power of the per-channel eighth-order harmonic waves (wavelength: 193 nm) were experimentally obtained. As described in the above-described embodiment, the output of the fundamental wave at each of the channel output

terminal is characterized by a peak power of 20 kW, a pulsewidth of 1 ns, a pulse repetition frequency of 100 kHz, and an average output power of 2W. As a result, the per-channel average output powers of the eighth-order harmonic waves were 229 mW in the wavelength conversion section 20 shown in Fig. 3A~~(a)~~, and 38.3 mW in the wavelength conversion section 20A shown in Fig. 3B~~(b)~~. Accordingly, the average output powers from the bundle of all the 128 channels are 29 W in the wavelength conversion section 20, and 4.9 W in the wavelength conversion section 20A. As such, in either of the wavelength conversion sections 20 and 20A, ultraviolet light having a wavelength of 193 nm beam, which is sufficient as an exposure-apparatus-dedicated light source can be provided.

Page 58, lines 10-19:

Hereinbelow, a description will be made regarding an example configuration of a wavelength conversion section that enables ultraviolet light having substantially the same wavelength as that of the F_2 laser (wavelength: 157 nm). To implement the above, as the wavelength conversion section 20, the configuration may be arranged to use a wavelength conversion section capable of generating the tenth-order harmonic wave with 1.57 μm wavelength of the fundamental wave generated in the single wavelength oscillatory laser 11 shown in Fig. 1A~~(a)~~.

Page 58, line 20 to page 59, line 8:

Fig. 4A~~(a)~~ shows a wavelength conversion section 20B that enables the tenth-order harmonic wave to be generated through combination of the second-order harmonic wave generation and the sum frequency generation. Referring to Fig. 4A~~(a)~~, the fundamental wave of the laser beam LB4, having a wavelength of 1.57 μm, which has been output from the output terminal 19a of the fiber bundle 19, is incident on a first-stage nonlinear optical crystal 602 formed of the LBO crystal, and is converted into the second-order harmonic wave according to the second-order harmonic wave generation. The second-order harmonic wave

is then incident on a second-stage nonlinear optical crystal 604 formed of LBO via a lens 603, and is converted into the fourth-order harmonic wave according to the second-order harmonic wave generation; and a part of the second-order harmonic wave is transmitted therethrough without being converted.

Page 60, line 19 to page 61, line 13:

Fig. 4B~~(b)~~ shows a wavelength conversion section 20C that enables the seventh-order harmonic wave to be generated through combination of the second-order harmonic wave generation and the sum frequency generation. Referring to Fig. 4B~~(b)~~, the laser beam LB4 (fundamental wave), having a wavelength of 1.099 μm, which has been output from the output terminal 19a of the fiber bundle 19, is incident on a first-stage nonlinear optical crystal 702 formed of the LBO crystal, and the second-order harmonic wave is generated therein according to the second-order harmonic wave generation. A part of the fundamental wave is transmitted as is therethrough. Both the fundamental wave and second-order harmonic wave transmits in a linearly polarized state transmits through a wavelength plate 703 (such as a 1/2 wavelength plate), and only the direction of polarization of only the fundamental wave is rotated through 90 degrees. The fundamental wave and the second-order harmonic wave is led through a lens 704 to be incident on a second nonlinear optical crystal 705 formed of the LBO crystal. The third-order harmonic wave is generated therein according to the sum frequency generation, and a part of the second-order harmonic wave is transmitted as is therethrough.

Page 62, line 18 to page 63, line 9:

As is apparent from Fig. 1A~~(a)~~, in the above-described embodiment, the combined light of the outputs of the n optical amplifier units 18-1 to 18-n in the m-group is converted in wavelength by using the single wavelength conversion section 20. Alternatively, however, the configuration may be arranged such that, for example, m' units (m' = "2" or larger inger)

wavelength conversion sections are provided. In the alternative configuration, the outputs of the m-group optical amplifier units 18-1 to 18-n are divided in units of n' outputs into m' groups (n·m = n'·m'), the wavelength conversion is performed for one of the wavelength conversion section in units of one of the groups, and the obtained m' ultraviolet light beams (in the present example, m' = "4", "5", or the like) are combined. Thus, the wavelength conversion section 20 is not limited to that having the above-described configuration. Moreover, for example, a CBO crystal (CsB_3O_5), an $Li_2B_4O_7$ (LBO), a KAB ($K_2Al_2B_4O_7$), or a GdYCOB ($Gd_XY_{1-x}Ca_4O(BO_3)_3$), may be used as an alternative crystal for the nonlinear optical crystal.

Page 63, lines 10-25:

According to the ultraviolet light generator of the above-described embodiment, the diameter of the output terminal of the fiber bundle 19, shown in Fig. 1A~~(a)~~, even with all the channels being included, is about 2 mm or smaller. As such, one or several units of the wavelength conversion sections 20 are sufficient to perform the wavelength conversion of all the channels. In addition, since flexible optical fibers are used for the output terminals, the flexibility in configuration is very high. For example, the configuration sections such as the wavelength conversion section, the single wavelength oscillatory laser, and the splitter, can be separately disposed. Consequently, the ultraviolet light generator of the present example enables the provision of an ultraviolet laser device that is inexpensive and compact, and has a low spatial coherence while it is of a single wavelength type.

Page 63, line 26 to page 64, line 21:

Moreover, according to the above-described embodiment, as shown in Figs. 6A and 6B~~Fig. 6~~, in the optical modulating device 12 shown Fig. 1A~~(a)~~, the continuous light of a predetermined level is output even in period in which the ultraviolet light (laser beam LB5) is switched "OFF". Thereby, optical surges are prevented from occurring in the rear-stage

optical fiber amplifiers 13, 22, and 25, and the output power of the desired value can be obtained immediately after the ultraviolet light is switched "ON". Instead of outputting the continuous light in the period in which the ultraviolet light is "OFF", the arrangement may be made to output a pulsed beam having a duty ratio (ratio of the high level "1" period to the pulse cycle) that is 10 times or higher, and preferably, 100 times or higher in comparison to those in the period in which the ultraviolet light is "ON". Also in this case, the peak level of the pulsed beam in the "OFF" period becomes 1/10 or lower or 1/100 or lower by controlling the average levels in the periods in which the ultraviolet light is switched "ON" and "OFF" to be substantially the same. Consequently, similar to the case of outputting the continuous light, optical surges are mitigated, and the efficiency of conversion into the ultraviolet light in the "OFF" period can be controlled to be substantially zero.

Page 64, line 22 to page 65, line 1:

Hereinbelow, a second embodiment of the present invention will be described with reference to Figs. 7 to 9. The present embodiment is different from the embodiment shown in Fig. 1A~~(a)~~ in portions of the configurations from the single wavelength oscillatory laser 11 to the optical fiber amplifier 13. A description will therefore be made regarding the different portions.

Page 66, line 7 to page 67, line 7:

In the present embodiment, as shown in Figs. 8A~~(a)~~ and 8B~~(b)~~, a first usage method is arranged such that the laser beam LB1 is turned off, and the laser beam LBR is controlled to continually emit in the "OFF" period in which the ultraviolet light is not output, and the laser beam LB1 is controlled to continually emit, and the laser beam LBR is turned off in the "ON" period in which the ultraviolet light is output. That is, the original laser beam LB1 and the auxiliary laser beam LBR are controlled to emit with opposite phases. In addition, as shown in Fig. 8C~~(c)~~, an application voltage V12 as a driving signal fed from the driver 3 to the

optical modulating device 12 is set in a pulse state only in the "ON" period in which the ultraviolet light is output. Thereby, as shown in Fig. 8D~~(d)~~, in the "ON" period, the laser beam LB2 to be output from the optical modulating device 12 is modulated into a pulse train (wavelength λ_1) of a frequency of about 100 kHz having a peak level LB and a width of about 1 ns. In the "OFF" period, the laser beam LB2 is modulated into continuous light (wavelength λ_2) of a level LA. The level LA in this case is set such that, for example, the average output power of the laser beam that have been output from the last-stage optical fiber amplifier 25 are substantially the same in the "ON" and "OFF" periods. Thereby, no optical surge occurs in, for example, the optical fiber amplifier 25. In addition, the conversion efficiency in the "OFF" period in which the ultraviolet light is not output substantially becomes zero, thereby avoiding a case where an unnecessary laser beam is output.

Page 67, lines 8-22:

In the present embodiment, as shown in Figs. 9A~~(a)~~ and 9B~~(b)~~, a second usage method is arranged such that the original laser beam LB1 and the auxiliary laser beam LBR are controlled to emit with opposite phases. In addition, an application voltage V12 (driving signal) fed from the driver 3 to the optical modulating device 12 is regularly set to be a pulse shape as shown in Fig. 9C~~(c)~~. Thereby, as shown in Fig. 9D~~(d)~~, in the "ON" period, similar to the case shown in Fig. 8D~~(d)~~, the laser beam LB2 output from the optical modulating device 12 is modulated into a pulse train (wavelength λ_1); and also in the "OFF" period, the laser beam LB2 is modulated into a similar pulse train (wavelength λ_2). Also in this arrangement, no optical surge occurs in, for example, the optical fiber amplifier 25, and an unnecessary laser beam is output in the "OFF" period.

Page 67, line 23 to page 68, line 4:

For the selection of desired one of the control methods shown in Figs. 8A, 8B, 8C, 8D, 9A, 9B, 9C and 9D~~8 and 9~~, the determination is preferably made according to the

wavelength characteristics of the optical modulating device 12 and the wavelength λ_2 of the auxiliary laser beam LBR. That is, one of the control methods may preferably be selected through which only light of the wavelength λ_2 is output from the optical modulating device 12 in the period ("OFF" period) in which the ultraviolet light is not output.

Page 68, lines 20-26:

Hereinbelow, a third embodiment of the present invention will be described with reference to Fig. 10. Also the present embodiment is different from the embodiment shown in Fig. 1A~~(a)~~ in portions of the configurations from the single wavelength oscillatory laser 11 to the optical fiber amplifier 13. A description will therefore be made regarding the different portions.

Page 69, line 18 to page 70, line 8:

In this case, in each of the optical fibers used in the present embodiment, the polarized state of the light propagating inside thereof is assumed to be preserved to some extent. In addition, the angle and other conditions of each optical fiber is assumed to be set such that a laser beam LB4 to be finally output from the optical fiber bundle 19 shown in Fig. 1A~~(a)~~ is in a polarized state that enables the maximum conversion efficiency to be obtained in the period ("ON" period) in which ultraviolet light is output from the wavelength conversion section 20. In addition, in the configuration example shown in Fig. 10, the polarization direction of the laser beam LB1 is set to a direction such that the maximum conversion efficiency can be obtained in the wavelength conversion section 20. The polarization direction of the laser beam LBP output from the auxiliary light source is set to a direction such that the conversion efficiency is minimized in the wavelength conversion section 20.

Page 70, line 9 to page 71, line 7:

Similar to the embodiment shown in Fig. 7, in the above-described embodiment, the laser beam LB1 and the laser beam LBP are emitted with opposite phases in the period ("ON"

period) in which the ultraviolet light is output and in the period ("OFF" period) in which the ultraviolet light is not output. In addition, the drive method for the optical modulating device 12 has two types. The one type controls the optical modulating device 12 to output the pulsed beam only in the "ON" period, as shown in Figs. 8A, 8B, 8C and 8D~~Fig. 8~~; and the other type controls the optical modulating device 12 to regularly output the pulsed beam, as shown in Figs. 9A, 9B, 9C and 9D~~Fig. 9~~. For the selection of desired one of the control methods shown in Figs. 8A, 8B, 8C, 8D, 9A, 9B, 9C and 9D~~8 and 9~~, the determination is preferably made according to the wavelength characteristics of the optical modulating device 12 and the polarized state of the auxiliary laser beam LBP. That is, one of the control methods may preferably be selected through which only the laser beam LBP is output from the optical modulating device 12 in the period ("OFF" period) in which the ultraviolet light is not output. Thereby, substantially constant outputs can regularly be obtained in the individual optical fiber amplifiers 13, 22, and 25, and optical surges are prevented from occurring. In addition, the efficiency of conversion in the wavelength conversion section 20 with respect to the ultraviolet light substantially becomes zero in the "OFF" period, thereby avoiding a case where an unnecessary laser beam is output.

Page 71, lines 26 to page 72, line 9:

Hereinbelow, an example exposure apparatus using the ultraviolet light generator shown in Fig. 1A~~(a)~~ will be described. Fig. 13 shows an exposure apparatus of the present example. Referring to Fig. 13, component members provided between the single wavelength oscillatory laser 11 and the m-group optical amplifier units 18-1 to 18-n in the ultraviolet light generator shown in Fig. 1A~~(a)~~ are used for an exposure light source 171. The ultraviolet light generator is tuned to be capable of converting the laser beam LB5 finally output into light in an ultraviolet region with one of wavelengths of 193 nm, 157 nm, and others.

Page 72, lines 10-18:

Most of a laser beam (fundamental wave) output from a light-source mainbody section 171 is fed to an illumination system 162 via a coupling-dedicated optical fiber 173 and a wavelength selection section 172. The rest of the laser beam is fed to an alignment system (described below in detail) via a coupling-dedicated optical fiber 178. The coupling-dedicated optical fibers 173 and 178 individually correspond to beams obtained by splitting the fiber bundle 19 shown in Fig. 1A~~(a)~~.

Page 72, line 19 to page 73, line 9:

The wavelength selection section 172 (which corresponds to the wavelength conversion section 20 shown in Fig. 1A~~(a)~~) converts the wavelength of the fundamental wave received from a light-source mainbody section 171, and outputs ultraviolet-region exposure light formed of the laser beam LB5. The illumination system 162 is configured of, for example, an optical integrator (homogenizer) for homogenizing illuminance distributions of the exposure light, an aperture diaphragm, a field diaphragm (reticle blind), and a condenser lens. In the aforementioned configuration, the exposure light output from the illumination system 162 illuminates a slit-like illumination region of a pattern surface of a reticle 163 set as a mask to provide a homogeneous illuminance distribution. In the present example, since the spatial coherence of the exposure light is so low that the configuration of a member for reducing the spatial coherence in the illumination system 162 can be simplified, and the exposure apparatus can therefore be further miniaturized.

Page 75, line 10 to page 76, line 6:

Exposure-light-amount control in the above-described scan-exposure operation may be implemented in the following manner. Control is performed for at least one of the pulse repetition frequency f, which is defined by the optical modulating device 12 shown in Fig. 1A~~(a)~~, and the interchannel delay time, which is defined by the delaying devices (optical fibers 15-1 to 15-m, and 17-1 to 17-n). The control is thus performed to cause the exposure

light source 171 to oscillate a plurality of pulsed beams at equal time intervals during scan-exposure operation. In addition, according to the sensitivity property of the photoresist, at least one of the optical intensity of the pulsed beam on the wafer 166, the scan speed for the wafer 166, the pulsed-beam oscillation interval (frequency), and the width of the pulsed beam in the scan direction for the wafer 166 (that is, an radiation region thereof) to thereby control the integrated luminous quantity of a plurality of pulsed beams irradiated in a period in which the individual points of the wafer traverse the radiation region. At this time, in consideration of the throughput, least one of other control parameters representing the pulsed-beam optical intensity, the oscillation frequency, and the radiation region width is preferably controlled so that the scan speed for the wafer 166 is substantially maintained to be the maximum speed of the wafer stage 167.

Page 77, lines 7-18:

In the present example, a laser beam (fundamental wave) from the light-source mainbody section 171 is fed to a wavelength conversion section 179 for the alignment system 180 via an optical fiber 178. For the wavelength conversion section 179, the present example uses a wavelength conversion section that is similar to the wavelength conversion section 20 shown in Fig. 1A~~(a)~~ and that is relatively small. The wavelength conversion section 179 is integrally provided on the frame that holds the alignment system 180, in which laser beam LB5 having the same wavelength as that of the exposure light that has been output from the wavelength conversion section 179 is used as illumination light AL.

Page 81, line 17 to page 82, line 5:

In the above-described embodiment, description has been made that the laser device shown in Figs. 1A and 1B~~Fig. 1~~ is used either as the exposure-dedicated light source or as the light source of the alignment system or the spatial-image measuring system. However, the laser device may be used as a regulating light source of a detecting system or an optical

system for marks other than the above. In addition, the laser device may be used not only as the light source of the exposure apparatus, the testing apparatus, or the like used in the device-manufacturing step, but also as a light source of various other apparatuses, regardless of the use and like thereof (an example is an conventional apparatus using an excimer laser as a light source, such as a laser medical treatment apparatus for performing medical treatment for, for example, the near site and the astigmatism, by correcting, for example, the curvature or the irregularity of the cornea).

Changes to Claims:

The following is a marked-up version of the amended claims:

1. (Amended) An exposure apparatus which illuminates a pattern of a first object with ultraviolet light from a laser device and exposes a second object with the ultraviolet light which has passed through the pattern of the first object, wherein~~characterized in that~~

the laser device includes:

a laser light generation section which generates single wavelength laser light in a wavelength range of from an infrared region to a visible region;

an optical modulating section which modulates the laser light generated by the laser light generation section;

an optical amplification section including an optical fiber amplifier which amplifies the laser light generated by the optical modulating section; and

a wavelength conversion section which performs wavelength conversion of the laser light amplified by the optical amplification section into ultraviolet light by using a nonlinear optical crystal, and

the optical modulating section performs pulse modulation of the laser light from the laser light generation section, and feeds the modulated laser light to the optical amplification section in a period in which the ultraviolet light is output, and the optical modulating section

feeds light of an amplifiable wavelength zone to the optical amplification section in a range substantially not influencing an output of the ultraviolet light even in a period in which the ultraviolet light is not output.

2. (Amended) An exposure apparatus as recited in claim 1, wherein~~characterized in that~~

the optical modulating section performs pulse modulation of the laser light from the laser light generation section and feeds the modulated laser light to the optical amplification section in a period in which the ultraviolet light is output, and the optical modulating section reduces the peak level of the output from the laser light generation section and feeds the resultant laser light to the optical amplification section in a period in which the ultraviolet light is not output.

3. (Amended) An exposure apparatus as recited in claim 2, wherein~~characterized in that~~

the peak level of the laser light to be fed from the optical modulating section to the optical amplification section in the period in which the ultraviolet light is not output is equal to or smaller than 1/10 of the peak level of the laser light fed from the optical modulating section to the optical amplification section in the period in which the ultraviolet light is output, and

an average level of the light output from the optical amplification section in the period in which the ultraviolet light is output is substantially the same as an average level of the light that has been output from the optical amplification section in the period in which the ultraviolet light is not output.

4. (Amended) An exposure apparatus as recited in claim 3, wherein~~characterized in that~~

the optical modulating section feeds continuous light to the optical amplification section in the period in which the ultraviolet light is not output.

5. (Amended) An exposure apparatus as recited in claim 1, wherein~~characterized in that~~

the optical modulating section includes an auxiliary light source which generates auxiliary light having a wavelength different from that of the laser light generated from the laser light generation section, and

the optical modulating section performs pulse modulation of the laser light from the laser light generation section, and feeds the modulated laser light to the optical amplification sections in the period in which the ultraviolet light is output, and the optical modulating section feeds the auxiliary light to the optical amplification section in the period in which the ultraviolet light is not output.

6. (Amended) An exposure apparatus as recited in claim 5, wherein~~characterized in that~~

a wavelength zone of the auxiliary light is within a gain range of the optical amplification section and out of a wavelength range in which wavelength conversion is possible by the wavelength conversion section, and

the optical modulating section further includes a wavelength division multiplexing member which combines the auxiliary light and the laser light generated by the laser light generation section, and a modulator which modulates light combined by the wavelength division multiplexing member.

7. (Amended) An exposure apparatus as recited in claim 5, wherein~~characterized in that~~

a wavelength zone of the auxiliary light is within a gain range of the optical amplification section and out of a wavelength range in which wavelength conversion is possible by the wavelength conversion section, and

the optical modulating section further includes a modulator which modulates the laser light generated by the laser light generation section, and a wavelength division multiplexing member which combines the light generated by the modulator and the auxiliary light.

8. (Amended) An exposure apparatus as recited in claim 1, wherein~~characterized in that~~

the optical modulating section includes an auxiliary light source which generates auxiliary light having a polarized state different from that of the laser light generated by the laser light generation section, and

the optical modulating section performs pulse modulation of the laser light from the laser light generation section, and feeds the modulated laser light to the optical amplification sections in the period in which the ultraviolet light is output, and the optical modulating section feeds the auxiliary light to the optical amplification section in the period in which the ultraviolet light is not output.

9. (Amended) An exposure apparatus as recited in claim 8, wherein~~characterized in that~~

the auxiliary light is not in a polarized state that allows wavelength conversion into ultraviolet light by the wavelength conversion section, and

the optical modulating section further includes a polarized-wave combining member which combines the auxiliary light and the laser light generated by the laser light generation section, and a modulator which modulates light combined by the polarized-wave combining member.

10. (Amended) An exposure apparatus as recited in claim 8, wherein~~characterized in that~~

the auxiliary light is not in a polarized state that allows wavelength conversion into ultraviolet light by the wavelength conversion section, and

the optical modulating section further includes a modulator which modulates the laser light generated by the laser light generation section, and a polarized-wave combining member which combines the light generated by the modulator and the auxiliary light.

11. (Amended) An exposure apparatus which illuminates a first object with ultraviolet light from a laser device and exposes a second object with the ultraviolet light which has passed through the pattern of the first object, wherein~~characterized in that~~

the laser device includes a laser light generation section which generates single wavelength laser light, an optical amplification section including an optical fiber amplifier which amplifies the laser light, and a wavelength conversion section which performs wavelength conversion of the amplified laser light, and

a light feed section is provided which feeds light to the optical amplification section in a condition different from that in a period in which the ultraviolet light is output even in a period in which the ultraviolet light is not output.

12. (Amended) An exposure apparatus as recited in claim 1~~any one of claims 1 to 11~~, ~~characterized by~~ further comprising:

an optical splitter section which splits the laser light generated by the laser light generation section into a plurality of laser light beams, wherein

the optical amplification section is independently provided for each of the plurality of the split laser light beams, and

the wavelength conversion section collects fluxes of the laser light beams output from the plurality of optical amplification sections and performs wavelength conversion thereof.

13. (Amended) An exposure apparatus as recited in claim 1~~any one of claims 1 to 11~~, ~~characterized in that~~wherein

the laser light generation section generates single wavelength laser light having a wavelength of near 1.5 μm, and

the wavelength conversion section converts a fundamental wave output from the optical amplification section having a wavelength of near 1.5 μm into ultraviolet light of a eighth-order harmonic wave or a tenth-order harmonic wave and outputs the converted light.

14. (Amended) An exposure apparatus as recited in claim 1~~any one of claims 1 to 11~~, wherein~~characterized in that~~

the laser light generation section generates single wavelength laser light having a wavelength of near 1.1 μm, and

the wavelength conversion section converts a fundamental wave output from the optical amplification section having a wavelength of near 1.1 μm into ultraviolet light of a seventh-order harmonic wave and outputs the converted light.

15. (Amended) An exposure apparatus as recited in claim 1~~any one of claims 1 to 11~~, ~~characterized by~~ comprising:

an illumination system which irradiates ultraviolet light from the laser device onto a mask as the first object: and

a projection optical system which projects an image of a pattern of the mask onto a substrate as the second object.

16. (Amended) An exposing method using an exposure apparatus as recited in claim 1~~any one of claims 1 to 11~~, comprising performing ~~characterized in that~~alignment between the first object and the second object ~~is performed~~ using the ultraviolet light generated by the laser device.

17. <u>(Amended)</u> An exposing method which illuminates a first object with ultraviolet light from a laser device and which exposes a second object with the ultraviolet light which has passed through the pattern of the first object, <u>comprising:</u>~~characterized in that~~

<u>amplifying</u> single wavelength laser light is amplified by an optical fiber amplifier, and <u>converting in wavelength</u> the laser light thus amplified ~~is converted in wavelength~~ into ultraviolet light, and

<u>feeding</u> light ~~is fed~~ to the optical fiber amplifier in a condition different from that in a period in which the ultraviolet light is output even in a period in which the ultraviolet light is not output.

18. <u>(Amended)</u> A method of manufacturing an exposure apparatus which illuminates a pattern of a first object with ultraviolet light from a laser device and which exposes a second object with the ultraviolet light which has passed through the pattern of the first object, ~~characterized in that~~<u>comprising configuring</u> the laser device ~~is configured~~ by disposing, with a predetermined positional relationship,

a laser light generation section which generates single wavelength laser light in a wavelength range of from an infrared region to a visible region,

an optical modulating section which modulates the laser light generated by the laser light generation section,

an optical amplification section including an optical fiber amplifier which amplifies the laser light generated by the optical modulation section, and

a wavelength conversion section which performs wavelength conversion of the laser light amplified by the optical amplification section into ultraviolet light by using a nonlinear optical crystal, and

the optical modulating section is configured such that the laser light output from the laser light generation section is pulse-modulated and fed to the optical amplification section

in a period in which the ultraviolet light is output, and light of an amplifiable wavelength zone is fed to the optical amplification section in a range substantially not influencing output of the ultraviolet light even in a period in which the ultraviolet light is not output.

19. (Amended) A device manufacturing method including ~~a step of~~ transferring a mask pattern onto a substrate by using the exposure apparatus as recited in claim 1~~any one of claims 1 to 11~~.